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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 10/647,046
Filing Date: August 21, 2003
Appellant(s): ARNOLD, STEVEN DON

Philip D. Askenazy
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed March 31, 2006 appealing from the Office action mailed August 03, 2005.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings, which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

6,062,026	Woollenweber et al.	05-2000
5,771,868	Khair	06-1998
6,301,889 B1	Gladden et al.	10-2001
6,205,785 B1	Coleman	03-2001

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claims 16-17 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Woollenweber et al. (Patent Number 6,062,026), in view of Khair (Patent Number 5,771,868).

Woollenweber discloses a method of providing exhaust gas recirculation to an internal combustion engine (11) comprising the steps of:

maintaining a pressure of cooled exhaust gas (via 41) produced by the engine (11) and which has not passed through a turbine (15) at a first intermediate pressure less than a pressure at an intake manifold of the engine;

increasing a pressure of intake air (by the compressor 18) to a second intermediate pressure;

mixing the exhaust gas and pressurized intake air to form a mixture (via mixing valve 35 and compressor 18); and

boosting the pressure of the mixture (by the compressor 23) to a pressure sufficient to meet a mass flow demand of the engine;

wherein the maintaining step comprises using back pressure from a turbocharger turbine (See Figures 3-6, Column 7, lines 34-67, Columns 8-9, lines 1-67 and Column 10, lines 1-7); and

wherein the increasing step comprises compressing the intake air with a first stage (by the compressor 18) of a two-stage compressor (the first stage compressor 18 and the second stage compressor 22) (See Figures 5-6).

However, Woollenweber fails to disclose the exhaust gas having been previously filtered.

Khair teaches that it is conventional in the turbocharged internal combustion engine art, to utilize to position the trap (29) before the intercooler to previously filter the exhaust gas (See Figure).

It would has been obvious to one having ordinary skill in the art at that time the invention was made, to have utilized the exhaust gas having been previously filtered before entering the intercooler, to improve the efficiency of the Woollenweber device.

Claims 1, 3, 5-9, and 11-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gladden et al. (Patent Number 6,301,889 B1), in view of Woollenweber et al. (Patent Number 6,062,026), and further in view of Khair (Patent Number 5,771,868).

Regarding claims 1 and 3, Gladden discloses an Exhaust Gas Recirculation (EGR) system providing a mixture of exhaust gas and intake air to the intake of an internal combustion engine, the system comprising:

a turbocharger (1) including a compressor (26) with more than one stage, wherein intake air is compressed in at least one first stage of the compressor (46, 50) , and a mixture of the compressed intake air and exhaust gas, which exhaust gas has not passed through a turbine (24) is compressed in at least one second stage of the compressor (48, 56);

wherein the compressor (46, 48) has two stages (See Figure 1).

However, Gladden fails to disclose a diesel particulate filter disposed to filter the exhaust gas before the exhaust gas enters the compressor, and the location of the diesel particulate filter being positioned before the EGR cooler.

Woollenweber teaches that it is conventional in the turbocharged internal combustion engine art having the exhaust gas recirculation system, to utilize a diesel particulate filter (41) to filter the exhaust gas

before the exhaust gas enters the first plurality of blades (See Figures 5-6).

Additionally, Khair teaches that it is conventional in the turbocharged internal combustion engine art having the exhaust gas recirculation system, to utilize the location of the diesel particulate filter being positioned before the EGR cooler (See Figure).

It would has been obvious to one having ordinary skill in the art at that time the invention was made, to have utilized a diesel particulate filter, as taught by Woollenweber, and position the diesel particulate trap before the EGR cooler, as taught by Khair, to lower the particulate emissions of the exhaust gas before re-entering the engine, since the use thereof would have reduce exhaust emissions of the charged internal combustion engine.

Regarding claims 5-9 and 11, Gladden further discloses a control valve (82), which determines the proportion of exhaust gas produced by the engine to be recirculated (Column 4, lines 5-20);

an EGR mixer (64) to mix the exhaust gas with intake air to form the mixture (See Figure 1);

wherein the intake air is compressed by at least one first stage of the turbocharger to achieve a first intermediate pressure, the first intermediate pressure being less than an intake pressure at

an intake manifold of the engine, and wherein back pressure from a turbocharger turbine maintains a pressure of the exhaust gas at a second intermediate pressure, the second intermediate pressure being less than an intake pressure at an intake manifold of the engine (See Column 4, lines 34-46);

wherein the turbocharger comprises:

a turbine inlet (30) receiving exhaust gas from an exhaust manifold of an internal combustion engine and having a turbine exhaust outlet (33), and a compressor (26) having an air inlet (52) and a first volute(See Figure 1);

a turbine wheel (42) extracting energy from the exhaust gas, said turbine wheel (42) connected to a shaft (38) (See Figure 1);

a bearing (40) supporting the shaft (38) for rotational motion (See Figure 1); and

a compressor impeller (46, 48) connected to the shaft (8) opposite the turbine wheel (42), said compressor impeller (46, 48) having a first plurality of impeller blades (50, 56) mounted on a front face proximate the air inlet (52, 58), said first plurality of blades (50) increasing the velocity of air from the air inlet (52) and exhausting air into the first volute, said compressor impeller also having a second plurality of impeller blades (56) mounted on a back face, said second plurality of blades increasing the velocity of air from a scroll inlet connected to the first volute and a source

of exhaust gas, and exhausting the mixture of exhaust gas and air into a second volute having a charge air outlet (via 74) connected to the engine intake (18);

wherein the second plurality of impeller blades (56) compresses the mixture to a pressure required by the engine to transit a desired mass flow (See Figure 1, Column 3, lines 9-67, and Column 4, lines 1-67, and Column 5, lines 1-27); and

at least one cooler (68, 79) (See Figure1).

Regarding claim 12, Gladden discloses the invention as recited above; however, Gladden fails to disclose at least one emissions control device.

Woollenweber teaches that it is conventional in the turbocharged internal combustion engine art having the exhaust gas recirculation system, to utilize at least one emissions control device (Read as Catalyst) (See Figures 1-6).

It would has been obvious to one having ordinary skill in the art at that time the invention was made, to have utilized at least one emissions control device, as taught by Woollenweber, to improve the exhaust emissions in the Gladden device.

Regarding claims 13-15, Gladden discloses an EGR system for an internal combustion engine wherein a turbocharger maintains a pressure of exhaust gas

at an intermediate pressure lower than a pressure at an intake manifold of the engine, wherein said intermediate pressure is greater than a pressure of intake air, the intake air having been compressed by a first stage of a two stage compressor (See Column 4, lines 34-46);

wherein the compressor (26) forms a part of a turbocharger (12);

wherein the exhaust gas and the intake air are mixed together to form a mixture (at 64), and the mixture is further compressed by a second stage of the two stage compressor (26) until the mixture reaches a pressure sufficient to meet a mass flow demand of the engine (See Column 3, lines 9-67, and Column 4, lines 1-67, and Column 5, lines 1-27).

However, Gladden fails to disclose a diesel particulate filter disposed to filter the exhaust gas before the exhaust gas enters the compressor.

Woollenweber teaches that it is conventional in the turbocharged internal combustion engine art having the exhaust gas recirculation system, to utilize a diesel particulate filter (41) to filter the exhaust gas before the exhaust gas enters the first plurality of blades (See Figures 3-6).

It would has been obvious to one having ordinary skill in the art at that time the invention was made, to have utilized a diesel particulate filter, as taught by Woollenweber, to lower the particulate emissions of the exhaust gas before re-entering the engine, since the use thereof would have reduce exhaust emissions of the charged internal combustion engine.

Claims 1 and 3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gladden et al. (Patent Number 6,301,889 B1), in view of Woollenweber et al. (Patent Number 6,062,026).

Gladden discloses an Exhaust Gas Recirculation (EGR) system providing a mixture of exhaust gas and intake air to the intake of an internal combustion engine, the system comprising:

a turbocharger (1) including a compressor (26) with more than one stage, wherein intake air is compressed in at least one first stage of the compressor (46, 50) , and a mixture of the compressed intake air and exhaust gas, which exhaust gas has not passed through a turbine (24) is compressed in at least one second stage of the compressor (48, 56);

wherein the compressor (46, 48) has two stages (See Figure 1).

However, Gladden fails to disclose a diesel particulate filter disposed to filter the exhaust gas before the exhaust gas enters the compressor, and the location of the diesel particulate filter being positioned before the EGR cooler.

Woollenweber teaches that it is conventional in the turbocharged internal combustion engine art having the exhaust gas recirculation system, to utilize a diesel particulate filter (41) to filter the exhaust gas before the exhaust gas enters the first plurality of blades (See Figures 5-6).

It would has been obvious to one having ordinary skill in the art at that time the invention was made, to have utilized a diesel particulate filter, as taught by Woollenweber, to lower the particulate emissions of the exhaust gas before re-entering the engine, since the use thereof would have reduce exhaust emissions of the charged internal combustion engine.

Additionally, it is the examiner' s position that the positioning of the diesel particulate filter before the intercooler in the above claimed positions would have been obvious to one having ordinary skill in the art. More specifically, one having ordinary skill in the art would have positioned the diesel particulate filter at any position in the EGR system in order that the exhaust gas needs to be cleaned/filtered before being delivered back to the engine. The use of the diesel particulate filter would have reduced the exhaust emissions of the turbocharged internal combustion engine.

Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Gladden (Patent Number 6,301,889 B1), in view of Woollenweber et al. (Patent Number 6,062,026), and further in view of Coleman (Patent Number 6,205,785 B1).

The modified Gladden device discloses the invention as recited above; however, fails to disclose the turbocharger being a variable geometry turbocharger.

Coleman teaches that it is conventional in the turbocharged internal combustion engine art having the exhaust gas recirculation system, to utilize a variable geometry turbocharger (46) (See Figures 1-2).

It would has been obvious to one having ordinary skill in the art at that time the invention was made, to have utilized a variable geometry turbocharger, as taught by Coleman, to improve the control of the exhaust gas, in the modified Gladden device, since the use thereof would have increased the efficiency of the engine.

Claim 20 is rejected under 35 U.S.C. 103(a) as being unpatentable over Woollenweber et al. (Patent Number 6,062,026), in view of Khair (Patent Number 5,771,868), in view Gladden et al. (Patent Number 6,301,889 B1).

The modified Woollenweber discloses the invention as recited above; however, Woollenweber fails to disclose the structural details a turbocharger having a two-stage compressor connected to the turbine.

Gladden teaches that it is conventional in the turbocharger art having an exhaust gas recirculation system, to utilize the turbocharger comprising:

a turbine inlet (30) receiving exhaust gas from an exhaust manifold of an internal combustion engine and a turbine exhaust outlet (33), and a compressor (26) having an air inlet (52) and a first volute (See Figure 1);

a turbine wheel (42) extracting energy from the exhaust gas, said turbine wheel (42) connected to a shaft (38) (See Figure 1);

a bearing (40) supporting the shaft for rotational motion (See Figure 1);

a compressor impeller (46, 48) connected to the shaft (38) opposite the turbine wheel (42) and said compressor impeller (46, 48) having a first plurality of impeller blades (50) mounted on a front face proximate the air inlet (52), said first plurality of blades (50) increasing the velocity of air from the air inlet (52) and exhausting air into the first volute, said compressor impeller also having a second plurality of impeller blades (56) mounted on a back face, said second plurality of blades increasing the velocity of air from a scroll inlet connected to the first volute and a source of exhaust gas, and exhausting the mixture of exhaust gas and air into a second volute having a charge air outlet (via 74) connected to the engine intake (18).

It would has been obvious to one having ordinary skill in the art at that time the invention was made, to have utilized disclose the structural details a turbocharger having a two-stage compressor connected to the

turbine, to improve the compression capabilities, in the Woollenweber device.

(10) Response to Argument

ISSUE 1: With regard to the 35 U.S.C. 103(a) rejection of Claims 16-17 and 19 as being unpatentable over Woollenweber et al. (Patent Number 6,062,026), in view of Khair (Patent Number 5,771,868).

1. In response to the appellant's arguments on the rejection of claims 16-17, appellant states that neither Woollenweber nor Khair discloses a filter positioned before the EGR cooler; and that there is no understanding of the importance of the filter efficiency or compressor damage as discovered by the present appellant because the filter of Woollenweber and Khair are optional (set forth on Pages 4-7 of the Appeal brief), the examiner respectfully disagrees.

First of all, in Figures 3-6 and in column 9, lines 28-30, Woollenweber discloses that "if desired, a particular trap 41 may be employed somewhere in the exhaust gas conduit 49 carrying the EGR gas; accordingly, the optional DPF of Woollenweber ('026) is capable to be located in front or after the EGR cooler and is used to filter the particles of the EGR gas before passing through the second compressor and then entering the engine.

Secondly, the optional PDF of Khair being position after EGR cooler as shown in Figure is used to modify the position of the DPF in the Woollenweber reference, which points out the same location as claimed in the instant application.

Thirdly, appellant's arguments that "the understanding of the importance of the filter efficiency or compressor damage as discovered by the present appellant' is germane to the rejected claim(s).

2. In response to the appellant's arguments on the rejection of claim 19, appellant states that neither Woollenweber et al. nor Khair teaches a two-stage compressor. The examiner respectfully disagrees with the appellant. Woollenweber and Khair do disclose a two-stage compressor including a first stage compressor (23); and a second stage compressor (18) (See Figures 3-6 of Woollenweber and Figure of Khair).

ISSUE 2: With regard to the 35 U.S.C. 103(a) rejection of Claims 1, 3, 5-9, and 11-15 as being unpatentable over Gladden et al. (Patent Number 6,301,889 B1), in view of Woollenweber et al. (Patent Number 6,062,026), and further in view of Khair (Patent Number 5,771,868).

The issue 1 above is the response to the appellant's arguments with respect to the rejection of claims 1, 3, 5-9, and 11-15, being similar to that presented in part (A) (set forth on pages 4-7 of the Appeal brief).

ISSUE 3: With regard to the 35 U.S.C. 103(a) rejection of Claims 1 and 3 under 35 U.S.C. 103(a) as being unpatentable over Gladden et al. (Patent Number 6,301,889 B1), in view of Woollenweber et al. (Patent Number 6,062,026).

In response to applicant's argument that there is no suggestion to combine the references as being set forth on Pages 7-8, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988)and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, the Gladden turbocharged internal combustion engine having an EGR system is modified by the PDF Woollenweber in order to lower the particulate emissions of the exhaust gas before re-entering the engine. Additionally, in Figures 3-6 and in column 9, lines 28-30, Woollenweber discloses that "if desired, a particular trap 41 may be employed somewhere in the exhaust gas conduit 49 carrying the EGR gas. Thus, the optional PDF of Woollenweber ('026) is capable to be positioned in front or after the EGR cooler and is used to filter the particles of the EGR gas.

Accordingly, the examiner has provided the clear motivations and reasons to combine Gladden with Woollenweber et al.

ISSUE 4: With regard to the 35 U.S.C. 103(a) rejection of Claim 4 under 35 U.S.C. 103(a) as being unpatentable over Gladden et al. (Patent Number 6,301,889 B1), in view of Woollenweber et al. (Patent Number 6,062,026), further in view of Coleman (Patent Number 6,205,785 B1).

In response to the appellant's arguments on Pages 8-9, the appellant argues that this rejection is essentially the same as that in (C) (set forth on Page 7-8 of the Appeal Brief) and also states that Coleman does not disclose a filter prior to the EGR cooler as required by claim 1.

First of all, the issue 3 is a part of the response to the appellant 's arguments.

Secondly, examiner agrees with the appellant that Coleman does not disclose a filter prior to the EGR cooler. However, the examiner has just relied on a variable geometry turbocharger (emphasis added) of the Coleman turbocharged internal combustion engine having an EGR system. Thus, as the modified Gladden-and-Woollenweber device includes a variable geometry turbocharger of Coleman, this modified device would have improved the control of the exhaust gas and increased the efficiency of the engine.

ISSUE 5: With regard to the 35 U.S.C. 103(a) rejection of Claim 20 as being unpatentable over Woollenweber et al. (Patent Number 6,062,026), in view of Khair (Patent Number 5,771,868), and further in view Gladden et al. (Patent Number 6,301,889 B1).

The issue 2 above is the response to the appellant' s arguments for the rejection of claim 20 (on Page 9 of the Appeal Brief), since the appellant states that this rejection is essentially identical to the in B.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

TTB
May 08, 2006

Thai-Ba Trieu
Primary Examiner
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Conferees:

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